

in a liner provided with ports, and this type of valve is perfectly balanced.

Cylinders.—In the cases where Corliss or drop valves are used with the ordinary type of engine exhausting at the ends, there is one steam valve above and one exhaust valve below, at each end of the cylinder. This position of the exhaust valve ensures that the cylinders are completely drained of water during the exhaust strokes. The ports are kept as short as possible to reduce the clearance volume. The use of separate valves and passages for steam and exhaust avoids to some extent the initial condensation caused by the inlet steam coming first into contact with surfaces that have just been cooled down by being swept by the cooler exhaust steam. This feature, together with the better drainage, accounts for the superior economy of this type of engine when compared with the slide-valve type, in which the valves are placed on the side or even on the top of the cylinders, and the same ports are used for both live and exhaust steam, their position making them useless for drainage.

The two steam-valve chests are usually connected by a longitudinal passage on the top of the cylinder, the inlet branch being at the centre of the length of the cylinder. This construction is avoided in the case of the exhaust, as it would cause a considerable portion of the lower part of the cylinder barrel to be jacketed by exhaust steam, a condition which would not be good for economy. When a liner is used, this objection is not so great. The steam exhausts through the feet of the cylinder, a pipe in the case of Corliss engines being bolted to the under side of the feet and the exhaust taken off this pipe at the centre, or where convenient. The top of the foundation is, of course, suitably cut away to accommodate this pipe. For convenience in manufacture, some makers prefer to build up the cylinder in three castings. The barrel is perfectly plain, and is bolted between the two ends which contain the valves and to which the covers are secured, the exhaust escaping through the feet, which are incorporated with the end castings. A separate pipe or casting is used for the steam supply to the valve chests, splayed out at the ends to suit the slit-like

openings above
the valves, and having the steam branch or facing in the
centre of its length.

In the case of drop-valve engines a liner is nearly always
provided, and
the valve chests and steam passages are cast with the
cylinder.

The steam speeds in the ports are about 100 to 120 ft.
per second for
the inlet steam, and 80 to 100 ft. per second for the
exhaust.

The thickness of cylinder barrels is fixed by the steam
pressure, allowing
a stress of about 1500 lb. per square inch in the metal,
with an allowance
for irregularity in thickness and for reboring, but in the case
of large low-
pressure cylinders, it is often decided by considerations of
casting, a finished
thickness of 1 in. for cylinders of 40 in. diameter and of 2
in. for 60 in.
diameter being common.

The covers are always of the deep cellular design, the
thickness of the
metal being about 0.7 of that of the cylinders. The metal
in the valve
chests may have the same thickness.

The cylinder studs should have a diameter such that
the stress at the